The accompanying table is calculated from the quantity of urea, taking 400 to 500 grains daily as a normal standard.

THE RELATION OF UREA TO SPECIFIC GRAVITY.

Specific gravity.	Per cent. urea.	Specific gravity.	Per cent. urea.
1.010	1.00	1.024	1.95
1.012	1.20	1.025	2.00
1.014	1.35	1.026	2.05
1.016	1.50	1.027	2.10
1.018	1.65	1.028	2.15
1.020	1.75	1.029	2.20
1.022	1.85	1.030	2.25
1.023	1.90		

Quantity of urine for twenty-four hours, 90 to 48 fluidounces, taking 400 to 500 grains as the normal daily quantity.

6 EAST FORTY-NINTH STREET, NEW YORK.

RECENT METHODS OF GASTROSTOMY FOR STRICTURE OF THE ŒSOPHAGUS.[1]

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THE surgery of the gastro-intestinal tract has made wonderful progress within the last fifteen years. Especially has that of the stomach been rapidly developed; and this, I believe, for the reason that not only do diseases of the stomach proper require operations on the organ, but also strictures of the œsophagus, at least in the majority of cases. In patients who suffer from a slowly but surely increasing cicatricial or cancerous stricture of the œsophagus the surgeon is called upon to perform gastrostomy—to establish a gastric fistula.

In former years every doctor who had a case of stricture of the œsophagus under his care dreaded to give his patient the advice to have the stomach stitched to the abdominal wall and opened. He generally sent the poor sufferer to the surgeon at the last possible moment, when even fluids had refused to pass the œsophagus—when rectal alimentation had become necessary. And why did the physician do this? why did he temporize as long as possible? Why did the surgeon, too, hesitate to perform the operation? Because the doctor had generally seen his patient die quicker with than without the operation; because, in most cases, the food which had been poured into the stomach through the tube in the artificial opening oozed out or even flowed back along the tube, so that not enough was retained to nourish the patient—the oozing, moreover, producing a troublesome painful eczema in the epigastric region; because, in one word, it had formerly been impossible to keep the walls of the fistula tightly adjusted to the tube.

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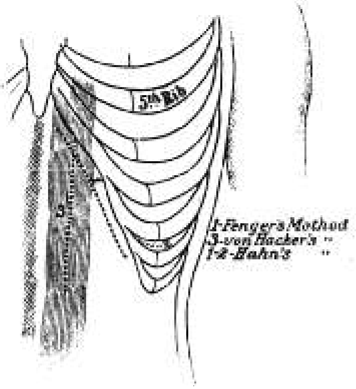
[1] Read before the Medical Society of the State of New York, at its Eighty-eighth Annual Meeting.

This formerly well-founded reason for delay happily does not any longer hold good. It cannot be said too often and emphasized too much, for the sake of all the unfortunates afflicted with stenosis of the œsophagus, that there are at present "a number of methods" at the surgeon's disposal which enable him to prevent regurgitation from a gastric fistula. Thus the patient will nowadays certainly not die from starvation.

These recent methods have put the indication for gastrostomy for stricture of the œsophagus on an entirely different basis.

Permit me to call your attention for a moment to the old method of performing gastrostomy, generally called the "method of Fenger."[1]

FIG. 1.



An incision three inches long is made parallel with the border of the left ribs from near the median line down to the eighth cartilage (1, Fig. 1). The abdominal wall, with the peritoneum, is divided in the same line. An area of the anterior wall of the stomach about one and one-half inches long and one inch wide is attached by sutures (about 15 to 20) to the cut surface of the abdominal parietes. Loose tamponade. Rectal alimentation. Three to five days later the dressing is removed and the stomach incised with a knife, between two slings, which had been put in at the time of the operation in order to identify the exact position for the opening; the latter was made very small. Hagedorn proposed to use Paquelin's thermo-cautery for making the puncture. Only if the patient were very low was the gastric fistula established at once.

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[1] The operation was originally proposed by Chr. A. Egeberg, a Norwegian military surgeon, in 1837; published in 1841. Charles E. Sédillot, of Paris, later of Strasbourg, gave it its name and its indications in 1846, and performed the first gastrostomy on the human subject at the Strasbourg Clinic, November 13, 1849. The operation was later modified in its details by C. E. F. Fenger, of Copenhagen, in 1853. The first successful case is that of Sydney Jones, of London, in 1875. The first case on record in America for obstruction of the œsophagus was performed by F. F. Maury, of Philadelphia, June 25, 1869; the first case in New York by A. Jacobi in 1874.

CASE I.—Man, aged forty-two years. Malignant stricture of the œsophagus near cardia. Only fluids pass. Marked emaciation. November 7, 1889, gastrostomy, first part, at the German Hospital; Fenger's incision. Two days later incision with Paquelin, just large enough to give entrance to a small-sized drainage-tube. Regular feeding. A few days later beginning leakage. Tube exchanged for larger size. Soon renewed regurgitation; mechanical devices fail to make the fistula water-tight; progressive eczema of surrounding skin in spite of proper treatment with pastes, etc. Increasing emaciation. Death from exhaustion and right croupous pneumonia, November 20th.

CASE II.—Man, aged sixty years. Cancerous stenosis of œsophagus near cardia. October 16, 1890, gastrostomy, first part, Fenger's incision. October 18th, stomach opened with Paquelin. Also in this case the same annoying consequences set in. Patient slowly lost ground, and died November 16th. Post-mortem showed a croupous pneumonia of the right upper lobe.

This primitive method of gastrostomy continued the only one in use for forty years. Owing to the generally experienced ill-success of this operation, as far as the functional result was concerned, methods of surgical interference for the sake of relieving the troubles of an œsophageal stenosis fell into great disrepute.[1] To-day Fenger's method, as originally proposed, is practically abandoned.[2]

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[1] A multitude of mechanical devices intended to avoid leaking have been brought out from time to time. I shall mention a few only. Von Langenbeck made use of a small rubber air-pillow with a central opening. Through it the tube, which was closed by a stopcock, passed into the stomach. The pillow was covered and held down by a piece of lead perforated in the middle and held in place by a circular elastic band. Lannelongue applied an hour-glass-shaped obturator, which could be blown up with air, the stomach-tube passing through its centre. Kappeler's assistant, Huber, constructed the following apparatus (Deutsche Zeitschr. f. Chirurgie, vol. xvii. p. 132): A tube made of horn, with an outward curve at its lower end, is split lengthwise, so that the two halves can be separately introduced and, when in place, readjusted. A wide rubber ring covers the lower trumpet-like (intra-gastric) end. It holds the tube firmly in place and avoids pressure. The upper straight part of the divided tube carries a worm and a screw-nut on its outer side. Where it emerges from the abdominal parietes it is surrounded by a small rubber air-pillow, which is held down by a metal plate screwed down upon it. Over the upper end the feeding-tube is slipped and closed by a clamp. In one of Kappeler's cases this obturator firmly closed a wide gastric fistula. Lately a glass tube of special construction has been recommended from Mikulicz's clinic. (Berl. klin. Wochenschr., 1893, No. 1.)

[2] Three years ago Terrier, of Paris, stated that he was able to avoid the egress of the contents of the stomach by making a very small incision and only introducing a tube for feeding purposes. At other times it is kept out. (Revue de Chirurgie, 1891, No. 4.) Lately T. Nicolaysen, of Christiania, similarly modified the old method. He lifts up a square-inch portion of the stomach wall to the parietes by 4 to 6 mattress sutures. They are tied over pieces of tubing after an area of the stomach of not larger than a bean's size has been stitched to the parietal peritoneum and muscles at the middle of the wound. The external wound is closed by deep and superficial sutures. Either at once or after twelve to twenty-four hours the stomach is incised. The hole is made small so as to let pass a Nélaton catheter of medium size. This is

It will be noticed that the great objection to Fenger's method was the liability to leakage from the fistula around the tube. Four methods have been recently devised to overcome this difficulty—the methods of Von Hacker, of Hahn, of Witzel, and of Ssabanejew-Frank.

1. *The method of Von Hacker.*[1] In this the operator makes the fistula through the left rectus muscle, so as to secure a sphincteric action from the tonic contraction of its fibres around the extruded portion of the stomach wall.

I shall describe the operation as I used to perform it. Longitudinal incision three inches long over the left rectus muscle, beginning about one inch below the border of the left ribs, and the same distance to the left of the median line (3, Fig. 1) Blunt dissection of the belly of the muscle—best with the handle of the knife.[2] Opening of peritoneal cavity. A fold of the anterior wall of the stomach as near to the fundus as possible is grasped with two fingers, pulled forward out of the wound, and at once secured with two slings of thin silk which embrace the serous and mucous coats of the organ. They are held by the assistants in the middle of the abdominal wound. These slings are left in the stomach, and will serve as a guide for the subsequent incision. Care is taken to let them pierce the stomach on a line parallel to its longitudinal axis. Then the incision between them will run parallel to the branches of the gastro-epiploic arteries, thus reducing hemorrhage. (This point was of some value if the stomach could not be lifted up well and the opening had to be established near the pylorus.) Now a silkworm-gut suture is passed near the upper border of the peritoneal wound through the entire thickness of the abdominal wall, including the skin, catching the stomach on its way. It is not tied. Its ends are clamped by an artery forceps. The same is done below, the stomach wall having been well stretched by the left hand of the operator, to make sure that it will afterward easily adapt itself to the peritoneum without producing folds. Then a number of silk sutures are put in on both sides—about eight or ten in all. They pass the serous and muscular coats of the stomach and embrace the entire thickness of the abdominal

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kept in for three days and then removed. It is temporarily reintroduced for feeding purposes. In two cases the functional result of the direct—not oblique—fistula was perfect. If desired it can be bluntly dilated. (Forhandl. i det Norske med. Selskab. Report in Centralbl. f. Chirurgie, 1894, N. 4, p. 83.)

[1] V. Hacker: "Ueber die Verwendung des Musculus rectus abdominis zum Verschluss der künstlichen Magenfistel," Wien. med. Wochenschr., 1886, Nr. 31 u. 32; und "Ueber die Erfolge der Gastrostomieen mit Sphincterbildung aus dem Musculus rectus abdominis," Wiener. klin. Wochenschr., 1890, Nr. 36 u. 37. C. Strunz: "Ueber fünf weitere Fälle von Gastrostomie mit Sphincterbildung aus dem Musculus rectus abdominis, V. Hacker," Chirurgische Beiträge aus dem Erzherzogin-Sophien-Spital, Wien, 1892. Rep. in Centralbl. f. Chirurgie, 1893, No. 9, p. 208.

[2] Girard suggested that some of the fibres of the rectus muscle should be crossed, in order to have a still more pronounced sphincteric action. (Correspondenzblatt f. Schweizer Aerzte, November 11, 1888.) According to other surgeons' and my own experience this is an unnecessary addition.

wall, but emerge in the subcutaneous tissue. They do not penetrate the skin. (A hook-shaped needle will be found most convenient for the purpose.) These sutures are tied at once. Then the silkworm-gut sutures are tied and the angles of the wound closed by a stitch or two. The middle of the wound, about one inch long, is left open and loosely packed with gauze. Dressing of the closed portion of the wound with iodoform gauze and collodion. The patient may partake of liquid diet if he be able to swallow; if not, rectal alimentation is resorted to.

Two or three days later the stomach is opened. Within this time the wound has healed by primary union and granulation commenced in that part of it which had been packed. The stomach juice coming in contact with the wound now will not disturb healing. This is, no doubt, an important point; Von Hacker specially emphasizes it. The fistula to be made in the middle of the incision will be far more satisfactory if the rest of the wound be healed by primary union. For this reason operation in two stages is preferable, but in greatly reduced patients we should, of course, try to give immediate relief. The incision is always made with the knife, and as small as possible, just large enough to admit the smallest-sized drainage-tube. Cocainization of the stomach wall is unnecessary. The patient does not experience any pain. Generally two small arteries spurt. They are clamped and tied. (Paquelin cautery is never used for opening the stomach. With it an eschar is made, which when pushed off rapidly enlarges the hole.) A long tube is now inserted *à frottement*, and about six inches of its external extremity left projecting beyond the abdominal wall. It is closed by a stopcock. Then the surrounding wound is repacked. Now the two silk slings are removed. The tube is held in place by slipping over it down to the abdominal wall a short piece of the next larger size of tubing, armed with two safety-pins. A piece of gauze, partially incised, is pushed underneath the pins, another one with a small centre hole on top. Both are held in place by the rubber adhesive plaster straps, as used for laparotomy, or by a square piece of muslin with a small centre hole and one or two long pieces of tape on either side, which pass around the body and are tied by the patient in front.[1] Soon an ointment dressing is applied. Ten days after the operation the patient gets up.

Von Hacker's method is no doubt a very good one. If properly carried out, leakage very rarely sets in. If it does, the tube must be exchanged for one of larger size. If the largest in the market has been put in and yet some of the food regurgitates at times, the tube should be removed during sleep, the stomach meanwhile being kept empty; on the following day it is replaced, and the fit will be perfect, as before. Von Hacker needed in his cases a special stomach canula with double rubber balloon (the Von Hacker-Scheimpflug canula).[1] All my patients have worn a simple rubber tube in the fistula. It fully occluded the opening. In none of these cases did eczema set in. According to my observations the small incised wound in the stomach first enlarges rather quickly; its borders are probably digested by the gastric juice. A tube three times as large as the first can be easily put in after about eight days. But soon—apparently with advancing cicatrization—the limit was reached. No larger sized tube is needed; the fistula becomes and remains patent. In one of my cases I saw the patient shortly before death—four months after the operation. He had a distressing, continuous cough, and expectorated, rather vomited, large masses of the ulcerating neoplasm. I satisfied myself that in the severest paroxysms of cough not a drop oozed out alongside the tube.

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[1] Other authors keep a short tube in place by closing it with a clamp just in front of the abdominal wall, which is then held down by the dressing. I prefer the method described and the long tube. The introduction of food through the tube can be done farther from the wound without disturbing the dressing.

I have described the technique of this operation and its after-treatment at some length, because it gave me satisfactory results, carried out in the way described. It is a slight modification of that originally devised by Von Hacker, who opens the stomach by a somewhat larger incision, so that a tube of 6 to 8 mm. diameter can be put in. He cuts down to a needle, which is thrust through a fold of the stomach at the first stage of the operation, embracing the whole thickness of the two walls of the organ, mucous membrane included, and stitches the latter to the skin. I believe that the last-mentioned point, especially, is not preferable. It seems to me that the possibility of leaking is lessened if the stomach wall be left *in situ* after the incision, and not extruded.

Six patients with cancerous stricture of the œsophagus, all males, have been operated by me according to this method. One died in five days after the operation, in consequence of extreme weakness; two succumbed to a perforation of the growth into the trachea on the tenth and twelfth days respectively after the operation; one lived three, one four and a half, one eight and a half months after the operation. In every one of the cases the functional result was good.

CASE I.—G. W., aged seventy years and six months. Admitted to German Hospital, April 4, 1891. Increasing symptoms of stenosis of œsophagus for last ten months. Fluids still pass. Sounding reveals an impermeable stricture of the cardiac end of the œsophagus. April 6th, gastrostomy, first part. Operation as above described. Liquids by mouth allowed. April 8th, primary union of abdominal wound; stomach incised with knife; opening just admits the smallest size drainage-tube; fistula closes water-tight from the beginning. April 20th, largest size tube put in; no leaking. April 27th, discharged; weight 117 pounds. Patient was presented to the New York Surgical Society on

[1] Max Scheimpflug: "Ueber eine neue Balloncannule für künstliche Magenfisteln," Wiener klin. Wochenschrift, 1888, Nr. 24 u. 25.

May 13th (*N. Y. Med. Journal*, December 5, 1891, p. 637), and to the Section on General Surgery of the Academy on October 12, 1891 (*N. Y. Med. Record*, October 24, 1891, p. 517). Had then gained considerably in weight; able to do light work. November 11th, fistula closed tightly around tube; patient swallows at times bread with butter; weight 135 pounds. In the following weeks intermittent leakage. Whenever it occurred, stomach was kept empty toward evening and tube left out during the night. On the following morning its fit was again perfect. On December 15, 1891, pneumonia set in, to which patient succumbed in three days (Isabella Home), December 18th, eight and a half months after the operation.

CASE II.—N. N., aged forty-six; entered the country branch of the New York Skin and Cancer Hospital, February 9, 1892. Marked symptoms of stenosed œsophagus. February 11th, gastrostomy, first part; feeding through the mouth on liquids, with rectal alimentation. February 14th, stomach opened and tube introduced; patient in good condition. He remained so for nine days, when suddenly symptoms of perforation of the growth into the trachea set in, to which the patient succumbed within twenty-four hours.

CASE III.—A. M., aged forty-seven; admitted to German Hospital, October 6, 1892. Difficulty in swallowing for the last eight months. Within the last few weeks had to be satisfied with fluid diet—even this often regurgitated; intermittent intense pain along sternum and dorsal spine; pulse weak and rapid; lost about fifty pounds; impassable stricture twelve and a half inches behind teeth. Rectal alimentation and subcutaneous stimulation preparatory to the operation. October 8th, gastrostomy, first part, working with A. C. E. mixture. Two days later stomach opened; external wound had healed by primary union; abdomen flat, painless; additional careful feeding through tube. October 12th, pulse not improved; patient very weak. October 13th, died under symptoms of heart failure.

CASE IV.—O. Sp., M.D., aged fifty-seven; increasing trouble in deglutition for nine months; lived on fluids for last six months—within last few days these cannot pass; at times lancinating pains through sternum and spinal column; extreme emaciation; aphony; laryngoscope reveals paralysis of left vocal cord; infiltrated hard glands in the left supraclavicular region. Sounding omitted on account of previous repeated hæmatemesis. Admitted to German Hospital, January 7, 1893. Gastrostomy, first part; morphine-chloroform narcosis. January 9th, stomach incised; smallest size tube put in. January 12th, patient able to drink. Ten days later the largest size passed; no leaking; careful feeding; patient up and about. February 1st, discharged. Abdominal wall closed firmly around tube. Patient was presented before the Scientific Society of German Physicians, March 24, 1893 (*N. Y. Med. Monatsschrift*, 1893, No. 2, p. 450). General condition satisfactory. In the second half of April he began to cough; for more than a week he expectorated, without accompanying hemorrhage, large masses of the ulcerating neoplasm, thereby regaining the use of his voice and temporary ability of deglutition. Patient was regularly seen by me during this time. He had distressing paroxysms of cough, but at no time any loss of gastric juice alongside the tube. The sphincteric action of the rectus muscle was perfect. Patient died of marasmus May 20, 1893, four and a half months after the operation.

CASE V.—A. S., aged forty-three; admitted to German Hospital, January 5, 1893. For one-half year increasing symptoms of strictured œsophagus; lately liquid diet only; pain in region of cardia, where solid food is arrested; cachexia. January 9th and 13th, gastrostomy, in two stages. February 12th, patient in good condition; has gained in weight and strength; tube fits very well. March 8th, presented before the New York Surgical Society in good general condition (*Annals of Surgery*, May, 1893, p. 592). Could now and then swallow bread and chopped meat, at other times not even fluids. He had lately learned to chew his food and make it slippery with saliva and then blow it through the large tube into the stomach. He gave up this procedure later because of the consecutive very annoying pressure in the stomach caused by the amount of air that had been blown in with the food. To get rid of some of that pressure he had to lie down, raise the tube perpendicularly and remove its stopcock. Patient left the hospital March 11th. He died of increasing marasmus in the first days of April, three months after the operation.

CASE VI.—E. R., aged fifty-two; admitted to German Hospital, January 4, 1893. Since last October rapidly increasing hindrance in swallowing; sound meets a slight resistance seven inches, and a second impassable one twelve inches, behind teeth; a hard, movable, aching tumor of goose-egg size, especially painful on pressure, in the left fossa supra-clavicularis, reaching underneath the clavicle. Has lost considerably. January 11th, gastrostomy. January 14th, abdominal wound healed without reaction; stomach opened. January 21st, 6 A.M., sudden intense dyspnœa. Expired one hour later under symptoms of perforation of the growth into the trachea.

2. *The method of Hahn.*[1] Published in 1890; first performed in June, 1877.

Fenger's transverse incision; peritoneal cavity opened in same line; second cut in the eighth intercostal space (1, 2, Fig. 1). Parietal peritoneum is punctured at this point by forceps or knife and enlarged by spreading forceps. A fold of the stomach is drawn through the space with a dressing forceps and fastened by stitches between the two cartilages.

Hahn performed the operation eight times up to 1890, and was pleased with its results. He affirms that diaphragm and pleura will not be injured, and believes that the cartilages of the ribs act like a sphincter or stopcock. Von Hacker saw in two cases, Dalton (St. Louis) in one, erosion of the cartilage of the ninth rib follow the operation. It did not, as it seems, come into favor.[2]

3. *The method of Witzel.*[3] Published in 1891. In this method the

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[1] Eugen Hahn: "Eine neue Methode der Gastrostomie." Centralbl. f. Chirurgie, 1890, No. 11, p. 193.

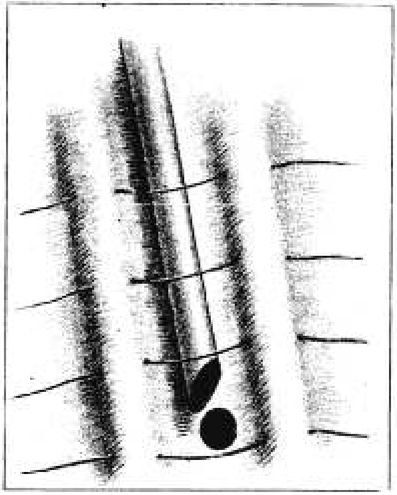
[2] This operation has lately been slightly modified by A. Coccherelli, of Parma. Incision in seventh intercostal space inward of axillary line only through skin. Later pulled downward. Division of eighth intercostal space; peritoneal cavity opened. Fold of stomach pulled forward and stitched to peritoneum below eighth rib. Stomach opened and sutured to skin-wound. This latter part of the operation is done, if possible, on fifth or sixth day after the operation.

[3] Oscar Witzel: "Zur Technik der Magenfistelanlegung," Centralbl. f. Chirurgie, 1891, No. 32, p. 601.

fistula passes through both the rectus and the transversalis muscles, whose fibres, running at right angles to each other, may be expected to contract still more efficiently than the rectus muscle alone. The second important feature of this operation of Witzel's is the infolding of the tube in the wall of the stomach, which is stitched over it so as to form an oblique canal.

Fenger's oblique incision through the skin and subcutaneous tissue. Longitudinal incision of the sheath of the rectus muscle. Blunt separation of the rectus and underneath of the adjacent transversalis parallel to the direction of their fibres. They are held apart by large blunt hooks. Division of the peritoneum obliquely. The stomach is drawn out in front of the wound, its margins being packed with sterilized gauze, and at once incised by a very small hole toward the cardiac extremity (Fig. 2). Into this opening a snugly-fitting rubber tube (of about 25 to 28 French gauge) is introduced and then buried in the wound of the stomach (infolded) to the extent of about one and one-half inches by stitching over it two folds of the stomach wall (double row of Lembert sutures), as seen in the diagram (Fig. 3). These folds run from the left down to the right and upward, parallel to the external wound. Special care must be taken to put a few stitches beyond the entrance of the tube where a small groove is formed (see Fig. 4).[1] The entire area is then stitched to the edges of the peritoneal wound by interrupted sutures, thus rendering the operating field extra-peritoneal. Then the

FIG. 2.



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[1] Instead of the twelve sutures marked in the diagram (Fig. 4). there should be about four to six.

large hooks, which hold the muscles apart, are removed. The latter return to their former position and hold the tube between themselves like a double (natural) clamp. The edges of the abdominal wound are sutured by silkworm-gut or silk up to its inner border where the external end of the tube emerges.

FIG. 3.

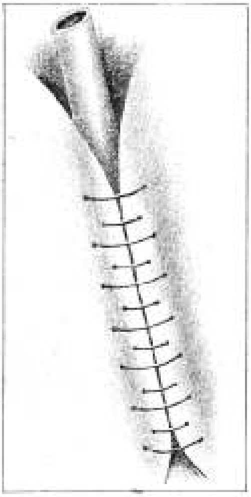
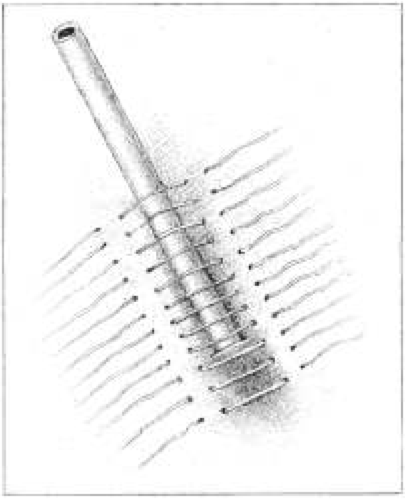


FIG. 4.



Witzel had thus operated on two patients for malignant stricture of the œsophagus with perfect success. The patients were fed through the tube immediately after the operation. At no time was there any leakage. He even removed the tube after nourishment had been poured into the stomach and reintroduced it temporarily when the next meal was due. The patient remained perfectly dry.

In January, 1893, Mikulicz had published by his first assistant, Von Noorden, five cases which had been successfully operated upon in this way: four for cancerous and one for cicatricial stenosis of the œsophagus.[1] In every one of the patients the tube fitted absolutely tight immediately after the fistula had been established.

In perusing the recent literature I see that the next cases of this kind published are my own, three in number.

CASE I.—A man, aged fifty-nine years, was admitted to the German Hospital, January 21, 1893. Difficulty in swallowing began about one year ago and had continued to increase; within the last days fluid refused to pass. There was great emaciation, and diffuse putrid bronchitis existed. A bougie was found to meet resistance near the cardia. January 23, 1893, gastrostomy was performed, strictly following Witzel's description.[1] The rectus and transversalis muscles were bluntly divided. A tube of 28 French gauge was used, and was buried in the wound for about one and three-quarters inches. The patient stood the operation very nicely. Some fluid poured in through the tube after the operation did not regurgitate. Later, feeding at regular short intervals. In spite of very frequent and hard coughing spells, there was not the slightest regurgitation at any time. A small strip of iodoform gauze had been put alongside the tube at the time of the operation, before the external wound was closed by stitches; this was removed on the third day. The wound had healed by primary union throughout.

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[1] Berliner klin. Wochenschrift, 1893, No. 1. In a postscript Mikulicz states that within the last two months the operation according to Witzel had been performed a few more times, always with the same satisfactory result.

According to Mikulicz's advice, the patient was kept flat on his back for a few days after the operation, in order to favor a proper working of the fistula. This, I believe, was a mistake. With my present experience I should have let such a patient sit up at once, to prevent pulmonary complications. On the third day after the operation the temperature suddenly rose and pneumonia developed. He died on January 26th, five days after the operation. Post-mortem showed bilateral pneumonia; no symptoms of peritonitis.

The specimen, which is of great interest, was presented to the New York Surgical Society, March 13th.[2] (See Fig. 7.)

Case II.—A woman, aged thirty-five years; first experienced difficulty in swallowing seven months ago. Admitted to German Hospital, February 24, 1893. An elastic bougie meets obstruction near the cardia. She had lost flesh considerably within the last few months. Great weakness. Pulse, 120. Marked gastrectasia. Enteroptosis. Immediate operative interference indicated, as fluids also were regurgitated. Operation February 26, 1893. Muscles bluntly divided. Rectus small. Incision covers a portion of external and internal obliques, which were also separated in the same way. Stomach very large. Easily pulled in front of the wound. Tube infolded for about two inches. Operation took longer than anticipated on account of some difficulty encountered in lining the field of operation with peritoneum at the lower angle of the wound.[3] Here a small strip of gauze was introduced into the peritoneal cavity for drainage, also alongside the tube. The latter was fastened with a silkworm-gut stitch to the skin, where it emerged. Rectal alimentation during the first twelve hours; then direct feeding through tube. No regurgitation. No tenderness over abdomen. No tympanites. Stimulation. Patient did not rally, however. She gradually sank, and died from heart-failure thirty-six hours after the operation.

Case III.—A man, aged fifty-six years, entered the German Hospital for stricture of the œsophagus, on March 16, 1893. He had acquired specific disease at the age of twenty-six. He first noticed difficulty in swallowing four years ago. One year later he came under the care of Dr. Max Einhorn, of this city. The latter had sounded him and found a stricture behind the bifurcation of the trachea. Under the use of iodides the patient improved greatly for a time, being soon again able to swallow all kinds of food. Every six to eight months the stenosis again manifested itself, but always yielded to anti-specific treatment. The latter consisted mainly of the iodides, as mercury always produced a marked and obstinate stomatitis. Three months ago he suddenly developed great difficulty in deglutition. Could not even drink fluids. Again a short turn for the better took place. Yet he followed advice and entered the hospital for an operation. Whilst there, he was suddenly attacked by a broncho-pneumonia, March 23d. There were râles all over the lungs, and marked bronchial breathing posteriorly over the right lower lobe; temperature ran up to 104°; extreme weakness. Quite suddenly the passage down to the stomach was again blocked for semi-solid food; only small quantities of fluid passed. I had to resort to rectal alimentation and strong subcutaneous stimulation. Luckily the fever dropped at this time, and soon a small amount of fluids could be swallowed again. On April 13th I could dare to submit him to Witzel's method of gastrostomy. Rectus muscle (fairly developed) is bluntly divided. Anæsthesia badly borne; there is continuous retching and coughing; pulse weak and rapid. The lower end of the operating-table was raised and the operation done throughout in this posture. In order to save time the oblique and transversalis muscles were divided with the knife according to the old Fenger's incision. Stomach rapidly found and pulled out. A 28 French-gauge tube was easily introduced and infolded, and the operating field lined with peritoneum. As some stomach juice had oozed out of the small incision during one of the strong paroxysms of cough, just when its borders were held aside with small sharp hooks in order to let the tube pass, a small strip of iodoform gauze was introduced through the lower angle of the wound into the peritoneal cavity, for safety's sake, and passed out between two of the silkworm-gut sutures which closed the external wound. Another small tampon was put alongside the stomach-tube. It emerged out of the median angle with the latter, which was secured there to the skin by a loosely tied silkworm-gut suture. Dressing. Feeding through the tube after a few hours. Patient was at once kept in a sitting position in bed to avoid further complications of the lungs. Nevertheless, signs of pneumonia with rise of temperature developed on the next day in the same area which had been attacked before. Patient coughed almost continuously. No better opportunity could be desired for demonstrating the brilliant functional result of this operation. It can be asserted that not a drop escaped from the stomach alongside the tube at any time. The wound healed kindly by primary union. The two tampons were removed after forty-eight hours. The lung trouble slowly subsided. Patient made a good recovery. He was presented to the New York Surgical Society on May 10, 1893.[1] He had taken his supper two hours before. The tube was removed and the man made to cough as hard as he could. Not a bit of stomach contents was pushed out. The skin around the fistula was, and is, up to date, in perfect condition. (See Figs. 5 and 6.) I noticed at that time, and do so still, a slight resistance when, on reintroduction, the tube enters the oblique canal which has been made through the stomach wall. This resistance is cer-

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[1] I believe that this was the first case of this kind operated on in this country.

[2] Annals of Surgery, May, 1893, p. 595.

[3] I believe that the difficulty was caused by infolding a longer portion of the tube than is necessary. One and a half inches will, it seems, be sufficient for producing a well-closing canal.

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[1] Annals of Surgery, November, 1893, p. 555.

FIG. 5.

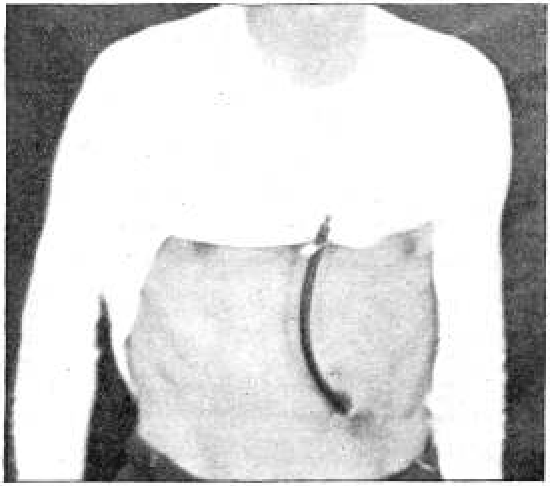
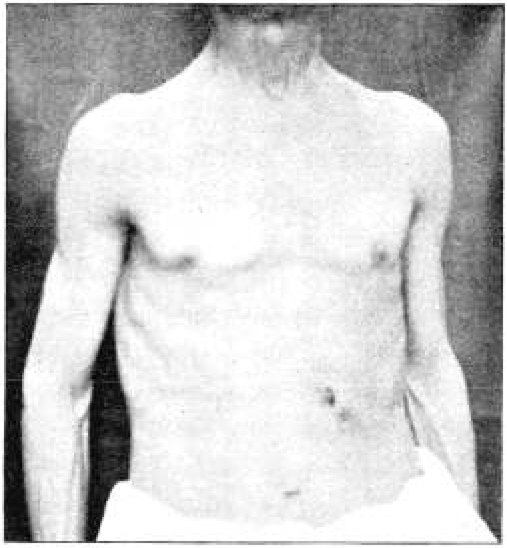


FIG. 6.



tainly due to contraction of the muscular part of the stomach wall. Patient was at the time of the presentation able to swallow bread and meat. This condition lasted for about four weeks, when within a few days the stenosis was found to be again impermeable. The passage became suddenly free twice since that time—on October 20th, and again on January 20th of this year. In October it occurred after a very severe paroxysm of cough, and lately after a hard sneeze. Each time semi-solid food could be well swallowed.[1] This enjoyable condition lasted about three weeks, when the old blockade reappeared. To-day the patient is in good general condition. He has gained flesh since the operation. He weighs now 126 pounds; before the operation, 113. I cannot yet endeavor to state the real cause of the stenosis. It seems to me impossible to pronounce it a syphilitic stenosis. Spasm and extra-œsophageal intermittent glandular swelling can, I believe, be excluded. It is also improbable on account of the long standing of the trouble, that a malignant growth has developed on the basis of specific scars or ulcerations. I am rather inclined to believe that the œsophagus is bent laterally behind the bifurcation of the trachea, held down to one side by extra-œsophageal contracted tissue. A diverticulum has probably formed at this spot. (The case resembles very much that reported by Maury in THE AMER. JOURN. OF THE MED. SCI., April, 1870, p. 365.)

As the patient is quite satisfied with his present condition, I have not yet interfered, in order to watch the further development in the function of the fistula, which so far is admirable. I hope to be soon able to report something more definite about the exact pathological condition and probably also of the curative factor in this interesting stenosis.[2]

Lately, W. W. Keen, of Philadelphia, has published a case[3] where he performed Witzel's method of gastrostomy in a man aged forty-eight years, for a primary cancer of the œsophagus. He was able to fully corroborate what had been observed by Witzel, Mikulicz, and myself. He also found the operation "effectual in preventing any leakage."[4]

Most probably other surgeons have meanwhile resorted to this method in proper cases. They have not, however, as far as I could find, published their experience.

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[1] A sound passed into the œsophagus at the time was stopped at the same spot as formerly, 10 to 10½ inches behind the teeth. The attempt at letting the patient swallow a perforated shot on a silk thread was also frustrated. If the manœuvre had succeeded, it had been my intention to localize the shot with the cystoscope, or in the empty stomach with the help of a urethral tube and head-mirror, catch it with a forceps, pull it out of the fistula and then use the thread for retrograde dilatation by tying tubes to its end.

[2] On February 20th I washed out the stomach and filled it with ten ounces of water, removed the tube, introduced the cystoscope, and searched for the cardia. I found it and introduced an elastic bougie into the œsophagus under the guidance of my eyes. About three to four inches up it was held by an impassable resistance.

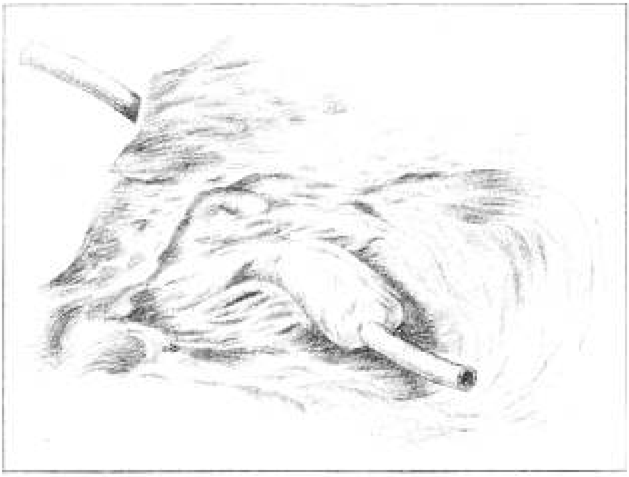
Meanwhile the patient died of broncho-pneumonia at the German Hospital, April 30, one year and seventeen days after the operation. *Post-mortem:* Cancer of the œsophagus behind bifurcation of trachea; communication of œsophagus with right bronchus; inner aspect of gastric fistula corresponds to the picture as shown in Fig. 7, cone, however, less projecting; there are a number of radial folds of the mucous membrane around the inner opening.

[3] "Gastrostomy by Witzel's Method for Primary Cancer of the Œsophagus." Annals of Surgery, December, 1893, p. 638.

[4] Another successful case in a man of seventy-two has lately been reported by Dudley Tait. Paper read before the California Academy of Medicine, May, 1894. Pacific Med. Journ., June, 1894.

Witzel's method is an excellent one. It is, beyond doubt, the best known. It is "simple, moderately rapid," and prevents leakage and its distressing sequelæ with "absolute certainty," even when the tube is removed. By infolding the tube, the entrance of the latter into the stomach is rendered oblique. Thus an organic valve is artificially formed. This explanation of Witzel is fully justified by the specimen obtained from my first patient. The condition is identically the same as found at the post-mortem of one of Mikulicz's cases. As seen in Fig. 7, which is drawn from the specimen, a short artificial cone obliquely protrudes into the lumen of the stomach. It is formed by the stomach wall itself, and is produced by the peculiar and ingenious mode of stitching the same over the tube. At its tip the tube emerges. It is evident that even when the rubber tube is removed, the intra-gastric pressure must close this internal entrance to the fistula by pressing its two walls upon each other. Mikulicz observed that in the course of time the outer and inner openings approached each other, so that the tube later enters the stomach rather in a straight sagittal direction, not, as at first, obliquely. Still, it worked to perfection. I did not experience this change of direction in my third patient, who has worn his tube now for almost ten months. It still passes the abdominal parietes obliquely, yet not quite so much as at first. This, however, is due to a superficial ulceration in the line of incision near the median angle which occurred about three months after the operation. Slowly the scar, which at this

FIG. 7.



place involved skin and subcutaneous tissue only, gave way. At present the tube leaves the scar at about the junction of its middle and inner thirds (see Fig. 6). The angle formed by the tube with the anterior abdominal wall is still 45°.

It is worth recording that Witzel suggested, in his first article, the same operative procedure for establishing a suprapubic vesical fistula. Zweifel, of Leipzig, was the first to carry out this idea, May 2, 1893, in a woman of thirty-eight years who had carcinoma of the urethra. (*Centralbl f. Chir.*, 1893, No. 37, p. 785). He extirpated the entire infiltrated canal, with a portion of the bladder, closed the latter by suture, and made a suprapubic artificial urethra, using, after laparotomy, the posterior wall of the bladder where it is covered by peritoneum. The result was ideal. Martin, of Cologne, successfully did the same operation on the extra-peritoneal suprapubic part of the bladder for pronounced hypertrophy of the prostate with retention, in a man of sixty-seven years (*Centralbl. f. Chir.*, 1893, No. 47, p. 1026). The functional result was all that could be desired. Wiesinger, of Hamburg, had a similar success in a woman of seventy years, on whom he had to operate for cancer of the urethra and the fundus of the bladder; also in anumber of patients who suffered from hypertrophy of the prostate. (*Centrabl. f. Chir.*, 1894, No. 22.) I personally tried the method on a patient of seventy-three years, with retention (due to hypertrophy of the prostate) and a large encysted stone, at the German Hospital (January 30, 1894). Suprapubic cystotomy was done, the stone removed, and the bladder closed by a double row of sutures down to lower angle of the vesical opening, where a soft rubber catheter was introduced. The latter was then infolded for about one and one-half inches, after Witzel's method; permanent drainage. Splendid functional result for the first two days; then, during a passage from the bowels, the lower end of catheter pushed out of the bladder. It had been purposely fastened to the outer skin only. Reintroduced; no leakage. Two days later the same accident; again replaced. This repeated manipulation spoiled the result. Patient now cured, with tightly closing wound around catheter. On August 20th I made use of the method in a man of sixty-five years of age with retention due to hypertrophy of the prostate. So far the result is extremely satisfactory. In a recent article, Witzel states that he had used his method of making an oblique fistulous canal with very good success in a lady for an enormous hydronephrosis. He advises the making use of it also in cases where the gall-bladder needs permanent drainage, and where a temporary artificial outlet must be given to the contents of the small intestine (*Centralbl. f. Chir.*, 1893, No. 47, p. 1025).

A few points referring to this method of operating, as observed in the case of the last patient with the lapse of time, may be mentioned here. If the stomach be very much distended, one and one-half pints to one quart having been poured in and the tube then removed, about one-half to one ounce first runs off, mixed with some bubbles of air. Then, suddenly, the outpour ceases. Even strong cough does not throw out a drop. This phenomenon is easily explained. In the very distended stomach the internal cone runs more in a sagittal line. If the tube be extracted, a sufficient amount must first be expelled before the canal again takes its oblique direction, thus producing the valve. But as soon as this is the case, the intragastric pressure at once shows its effect. If the tube be left in place, the fistula is always patent, no matter how much fluid is poured into the organ.

Another feature which is very marked in my case is the rapid contraction of the canal after the removal of the tube. It has happened quite often that the man coughed the tube out over night in one of his frequent severe cough-paroxysms, and, timid as he is, did not dare to at once replace it. When he then came to my office the next morning, the walls of the fistula had perfectly approached each other. (A urethral steel sound of the size of the tube pushed into the stomach always sufficed to make room for the tube.) For this reason I did not allow the patient to remove the tube temporarily and reintroduce it for each feeding, as Witzel did in one of his patients. Keen also "had tried to remove the tube temporarily in his patient, but had to abandon it from the difficulty of its reintroduction." Perhaps this rapid contraction is, in my case, due to the cicatricial tissue which had formed around the tube on its way through the abdominal parietes. As stated above, the muscles had been divided with the knife, and, of course, retracted at the time of the operation. However, the active contraction of the bluntly divided muscles of the abdomen will no doubt generally produce the same effect. I therefore believe we will do well in warning our patients not to leave the tube out for any length of time. They will then certainly not be in need of medical help.

I further mention as an interesting phenomenon that as long as the man was obliged to feed himself through the tube only, he had a ravenous appetite, but when he could swallow by the mouth the appetite was at once markedly diminished. When the œsophagus is obstructed, the patient brings up large masses of saliva and mucus about every half-hour. Sometimes the irritation of its presence above the stricture is not sufficient to produce a retrograde reflex spasm of the œsophageal muscles. Then the patient complains of a heavy, annoying pressure in the region of the bifurcation of the trachea. He tickles his throat with a feather until he throws up these masses, then generally mixed with some of the material that had been poured into the stomach. It seems to me most plausible that "the want of satisfaction of the sense of taste," which Keen also mentions, is the cause of the often observed constant hunger in patients with an impermeable stricture of the œsophagus, also after the gastric fistula has been established. For this reason we should induce patients of this kind to chew the solid food, and then either spit it out and have it washed into the stomach through a funnel, or blow it directly in through the tube themselves. This latter procedure I had done in one of my cases operated upon according to Von Hacker's method. As mentioned above, the patient did not like it, however, on account of the heavy pressure which was caused by the air blown in with the food.

I might here briefly discuss two points of the operative procedure. The blunt division of the rectus and transversalis muscles corresponding to the direction of their fibres. Is this a point of vital importance? Can it always be carried out? In my first case the man, a laborer, had not a particle of fat left, but a splendidly developed muscular system. Almost the entire length of the oblique incision struck the left rectus muscle. It was divided with the scalpel-handle in its middle, and the two parts then drawn aside with two large blunt hooks. Then the transversalis was divided, following the direction of its fibres. The operation could be easily finished. However, the assistants assured me that it required all their force to hold the hooks sufficiently apart. In my second case the rectus was very small. The incision also traversed the oblique. I divided all four muscles bluntly, and had them held apart. I found great difficulty in stitching the stomach to the lower (outer) corner of the peritoneal wound. In carrying out this point to the letter, I certainly wasted some valuable time, which, considering the reduced condition of the patient, was not immaterial. In my third case I began the operation also with the intention not to cut the muscles. However, I noticed soon that I would have to divide the rectus muscle almost three-quarters down to the umbilicus, in order to gain the necessary space. I therefore divided the rectus muscle bluntly and then cut the other muscles with the knife, leaving the two parts of the rectus muscle out of the grasp of the hooks. When the intra-abdominal work had been completed, the external portion of the rectus fibres was lifted, and the tube passed underneath. I believe that this was unnecessary. The patient has now been under observation for ten months. His fistula is absolutely patent. I should therefore say that the final result of this operation will not be impaired, as far as its functional result is concerned, if the oblique and transversalis muscles be divided with the knife in the line of the incision. Of course, if blunt division be feasible, it should always be carried out. (It will be easier if we make the incision through the skin obliquely, and straight instead of curved parallel to the border of the ribs.) Thus, as Witzel emphasizes, will be avoided the formation, arising from the retraction of transversely divided muscles, of a dead space between the fixed portion of the stomach and the skin, which slowly has to fill up with cicatricial tissue. I also believe that the tube is more firmly held in place, and does not so easily glide out of its position in consequence of a coughing or sneezing spell, if compressed by the tonic contraction of muscular fibres that cross each other at right angles.

Is it necessary to line the field of operation on the stomach with parietal peritoneum? This certainly will guard against peritonitis by placing the same extra-peritoneal, and should therefore be done. How? If we make use of the interrupted suture—as Witzel seems to have done, and as I did in all my three cases—this part of the operation is time-robbing. In future cases I should first secure both angles of the peritoneal wound with a silkworm-gut suture, piercing the entire abdominal wall and catching the wall of the stomach outside of its operating field. These sutures are then held on the stretch without being tied, and a continuous suture is rapidly run from one end to the other on both sides. Perhaps even that is superfluous. Keen (*loc. cit.*) put three stitches through the stomach and then lifted it up by pushing the needle through the entire thickness of the abdominal parietes.

4. Ssabanejew-Frank method (previously called Frank's method). In this operation a cone of the stomach is drawn up out of Fenger's incision under a bridge of skin to a point above the border of the ribs, where it is fixed and opened.

I append the names of the two authors to this operation, because it appears, on perusing the literature, that J. F. Ssabanejew, of Odessa, devised and performed the identical operation[1] as early as May, 1890, and it was first done by R. Frank, first assistant of Albert, in Vienna, on November 23, 1892. The latter's patient was presented to the Imperial Society of Physicians of Vienna, December 9, 1892.[2] There is no doubt that Frank conceived the plan for the operation, being unaware of Ssabanejew's former similar procedure.

The operation is as follows: Fenger's oblique incision, pretty close to and parallel with the costal cartilages. The muscles should be bluntly separated according to the direction of their fibres. After dividing the peritoneum the stomach is drawn forward and a cone, of about one to one and one-half inches high, of the anterior wall of the stomach from near the fundus, held outside and in front of the wound with the help of one or two silk slings. The edges of the incised peritoneum are now stitched to the stomach around the base of this cone. Thus the peritoneal sac is at once closed. (Fig. 8.) Frank advises to also stitch the divided muscles to the stomach in order to strengthen and remove tension from the first row of sutures. A second incision is now made above the border of the ribs, three-quarters to one inch long and about one and one-quarter to one and one-half inches apart from the first one. It only penetrates the skin. The interposed bridge of skin is bluntly undermined, and the stomach cone pulled underneath it and out of the upper wound with the help of the silk slings. (Fig. 9.) The wound of the abdominal wall is closed and the stomach incised with the knife for about one-half inch (very handily done between the two slings), and stitched to the skin. (Fig. 10.)

Ssabanejew has done the operation four times for cancer of the œsophagus. The patients lived from four days to ten months afterward. Their general condition greatly improved for some time. Regurgitation through the fistula could be easily prevented. In two cases the autopsy showed the gastric fold firmly healed in its new position. Its nutrition was not impaired by the curving and tension. The fistula was two to three inches long.

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[1] J. F. Ssabanejew, Odessa: "Ueber die Anlegung einer röhrenförmigen Magenfistel bei Verengerungen der Speiseröhre," Vratch, 1890, No. 39; and Chirurgitscheski-Vestnik, June, 1893, published in the Russian language. Cf. Report in Centralblatt für Chirurgie, 1893, No. 40, p. 862.

[2] Rudolf Frank: "Eine neue Methode der Gastrostomie bei Carcinoma œsophagi," Wiener klinische Wochenschrift, 1893, No. 13.

FIG. 8.

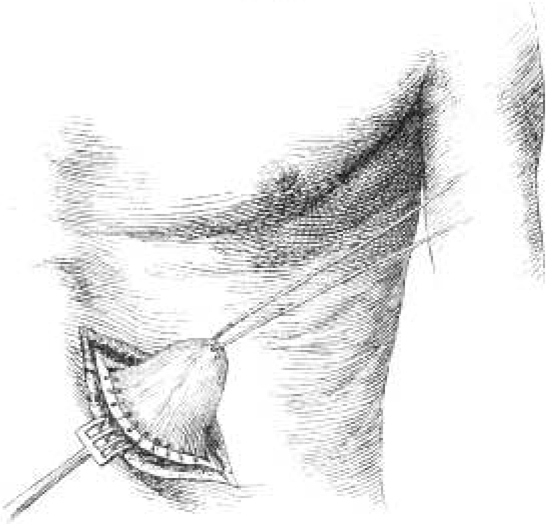
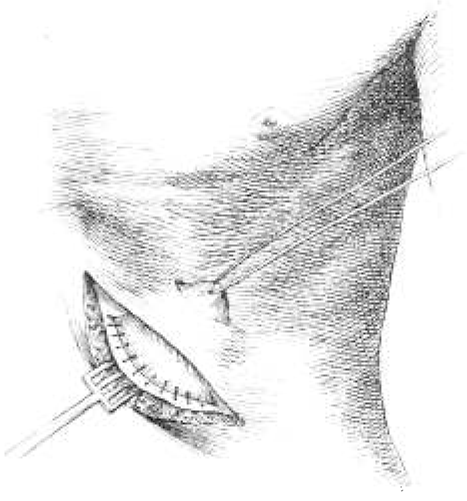


FIG. 9.



Frank reports four cases. Every one was successful also as far as the working of the fistula was concerned. He explains the favorable mechanical effect of this operation as follows: "As in Hahn's operation, the external opening of the fistula is raised; only if the stomach be filled to a great extent does the level of its contents reach the line which corresponds to the external opening (see Fig. 11). The incised gastric cone is bent over the border of the ribs; the bridge of skin covering the cone compresses it. In all of Frank's cases the fistula

FIG. 10.

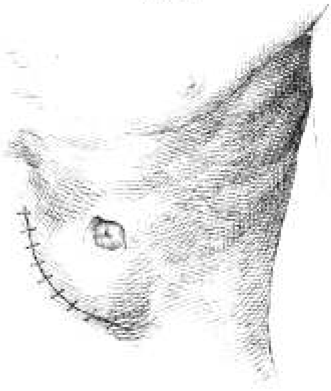
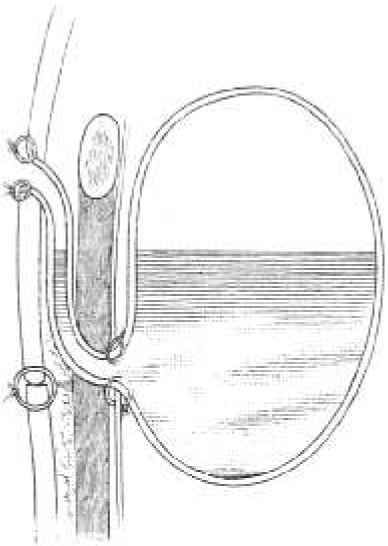


FIG. 11.



closed absolutely water-tight at all times without the use of a special apparatus. Only for the purpose of feeding was a catheter or drainage-tube introduced. Immediately afterward the patients could freely move around without losing anything of the stomach contents. No complaints were made on account of the drawn-out wall of the stomach. Frank adds that the principle brought out in the operation, namely, to let the fistulous canal pass the abdominal parietes in a curved direction underneath a stretched cutaneous bridge, might also be useful in cases of colostomy for cancerous rectal stenosis.

My own experience has been derived from the following three cases:

Case I.—A man, aged sixty-seven years, lately treated for cancer of the pylorus, had brought up everything, fluids included, within the last eight days; intense emaciation. Admitted to the German Hospital, April 17, 1893. Stenosis near cardia; impassable. Operation, April 20, 1893. On account of the deep concavity of the abdomen the cone could not be pulled farther, in the strongly built man, underneath the skin-bridge than about one-half inch over the border of the ribs. There it was opened and incised; a tube was introduced. Immediate feeding. No regurgitation. Patient died of heart-failure the following day. I believe that here general narcosis had been contra-indicated; I should have used cocaine anæsthesia.

Case II.—A man, aged sixty-one years, had symptoms of malignant stricture of œsophagus since last spring. On entering the German Hospital, April 17, 1893, he was very low, emaciated, and anæmic. Not a drop of water passed down. Rectal alimentation and stimulation—the latter also subcutaneously—preparatory to the operation, which was done April 24, 1893. Stomach greatly contracted; it could not well be drawn forward. Nevertheless the operation was finished without special difficulty. Skin bridge a little more than one inch wide. Second incision about three-quarters of an inch above border of the ribs. Patient stood the operation well. Lower wound healed by primary union. As a consequence of the undue traction exerted upon the attachment of the skin, a part of the lower circumference of the opening in the stomach somewhat retracted, and the upper wound, which had originally been made at least three-quarters of an inch above the border of the ribs, was pulled down below this border. Yet the result was good. I believe that undue tension can be avoided by putting a stitch of silkworm-gut through the entire thickness of the abdominal wall at both angles of the peritoneal wound, catching on its way a portion of the stomach. They are not tied until the stomach has been stitched to the peritoneum all around. They will hold the stomach thoroughly up to the abdominal wall, preventing traction on other sutures. Patient made a good recovery. He was presented to the New York Surgical Society on May 10, 1893.[1] He did not wear a tube except at the time of feeding. A large tube of almost a thumb's size is then always easily introduced. When presented, the patient had a full stomach; more water was added, and the man was then ordered to cough hard. Not a drop escaped. The functional result was certainly all that could be desired. Patient died on June 14th, in consequence of cancerous cachexia.

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[1] Annals of Surgery, November, 1893, p. 55.

CASE III.—H. S., a boy, aged four years, with impassable cicatricial stenosis of the œsophagus. Gastrostomy according to Von Hacker had been performed by Dr. Gerster for the sake of retrograde sounding and cutting with the string (Abbe), July 20, 1893. Feeding through the fistula. Considerable leakage from the stomach. Three days later the gastric opening was closed. The external abdominal wound healed by granulation. For a time the boy was better, when, about September 1st, a sound again refused to pass the stricture. He lost ground steadily. Patient then came under my care. Ssabanejew-Frank operation October 3, 1893. Stomach found fixed to the parietal peritoneum by very dense adhesions. It was freed for an area of about three inches, then its anterior wall pulled forward, the cone passed under a skin-bridge of about one and a quarter inches in width, and opened. There was great tension. In order to stitch the stomach to the lower circumference of the upper wound, a short longitudinal cut had to be added, thus making a T-shaped incision. Boy stood the operation nicely; but there was almost continuous leakage in spite of all trials to prevent it. On account of the complications presented in the case, this unsatisfactory functional result cannot well be brought forward against the value of the operation.

In reviewing the three operations advisable for gastrostomy—those namely, of Von Hacker, Witzel, and Ssabanejew-Frank—with reference to the usefulness and indication of each, we must pay attention to the character of the stenosis.

1. *Cicatricial.* Here the gastric fistula must be temporarily established if regular sounding from the mouth or from an artificial œsophageal lip-fistula in the neck[1] does not succeed, or succeeds only up to a certain degree of dilatation. This is especially experienced in treating long tubular strictures of the thoracic portion of the œsophagus. In such cases the surgeon performs gastrostomy—

a. For retrograde blunt dilatation, which, if successful, is later substituted by sounding from above.

b. For the purpose of enabling him to strive for a radical cure, viz., to divide the stricture (internal œsophagotomy) and then stretch it with sounds.

The stricture can be cut with small knives on a string, pulled through from below (Lange), or with a straight urethrotome introduced from an œsophageal fistula in the neck, after careful disinfection of the stomach and of the portion of the œsophagus below the fistula in the neck (Willy Meyer, *loc. cit.*), or with a string (Abbe).[2]

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[1] Graser: "Zur Behandlung der Œsophagus-Stenosen," Verhandlungen der Deutschen Gesellschaft f. Chirurgie XIX. Congress, 1890, p. 136. Willy Meyer: "External Œsophagotomy in the Operative Treatment of Cicatricial Stricture of the Œsophagus; with a Proposition for Improving the Method of Performing Internal Œsophagotomy," N. Y. Med. Journ., 1892, p. 561.

[2] "A New and Safe Method of Cutting Œsophageal Strictures," N. Y. Med. Record, February, 1893, p. 225.

Internal œsophagotomy (cutting with a knife) is considered a dangerous operation up to the present date. This mainly on account of the surgeon's inability to properly disinfect the operating field; next on account of the danger of perforating the canal, injuring an adjacent vessel or nerve, etc., and setting up acute posterior mediastinitis. The first danger can be averted by carrying out the proposition made by me in 1892 (*loc. cit.*), viz., to add gastrostomy to external œsophagotomy. The safest radical method seems to be Abbe's operation—to relieve the œsophageal stricture by cutting with a string. It has to be proved yet, however, by a series of cases, that this method also properly and safely divides, with the hope of a permanent cure, a long tubular stricture of the thoracic portion. No doubt the two cases presented by Dr. Abbe to the New York Surgical Society[1] will induce surgeons to try his procedure before all others in cases that need an operation.[2]

But is there any way of avoiding the development of a marked cicatricial stenosis of the œsophagus, with its terrible suffering and sometimes incurable consequences for the patient?

In 1887 Maydl,[3] of Vienna, proposed to perform in such cases gastrostomy as early as possible—very soon after the acid or caustic lye, etc., has been swallowed. In this way the food would not pass over the intra-œsophageal ulcerations—the continuous chemical and mechanical irritation would be avoided. Fluids might be swallowed; they would help to wash off the surface. Of course, cicatricial tissue would nevertheless be formed; there would also be the same tendency to its re-contraction; a stricture would form if matters were left to themselves. But by proper and "timely" sounding from below and above most probably can be avoided the narrow, twisted, often impermeable stricture which confronts the surgeon in almost every instance if no operation be performed.[4] In view of the brilliant functional results obtained by Witzel's method, Mikulicz has again taken up this idea. He believes that "It will be wisest in severe cases of burn of the œsophagus to establish a gastric fistula *early*, to protect the reparative process inside the canal against the disturbances caused by the passage of the food." In his one case mentioned above, where the elastic bougie did not pass any longer (for five days), swallowing became easier without help four weeks after the operation. Now a bougie cure, from above, was feasible and was successful. One month later semi-solid food passed with ease. The tube was removed from the stomach. The fistula closed spontaneously without further interference within sixteen days.

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[1] Report of New York Surgical Society. Annals of Surgery, July, 1893, p. 37, and January, 1894, p. 88.

[2] See also, W. T. Mayo: "Stricture of the Œsophagus; Division and Dilatation after Gastrostomy and Œsophagotomy; Testimony as to the Value of Abbe's String Method of Division," N. Y. Med. Journ., April 7, 1894, p. 433.

[3] "Die Magen-Chirurgie der letzten fünf Yahre," Internat. klin. Rundschau, 1887.

[4] Von Hacker proposes to start sounding of the œsophagus with the help of this gastric fistula, two or three weeks after the accident. Ueber die nach Veractzungen entstehenden Speiseröhren-Verengerungen. Wien, 1889, p. 121.

Which of the three operations shall be performed in such a case? Frank states that his operation is devised for carcinomatous strictures only. It would require a troublesome operation to close the resulting fistula. Von Hacker's and Witzel's methods thus only come up for discussion.

With reference to the absolute patency of the fistula resulting from Witzel's procedure, we shall not fail by always giving it the preference, provided it can be carried out. Contra-indications are, according to Von Noorden:[1] 1. Great weakness of the patient, which would forbid an operation of nearly half an hour's time. This objection would not hold good any longer if we accept "early gastrostomy" in severe burns of the œsophagus. 2. If, on account of cicatricial tissue in the gastric wall, the two folds of the latter cannot be properly raised. This objection also falls to the ground if gastrostomy be done shortly after the accident. 3. If the stomach wall does not yield to traction. Witzel asserts that "even the very much contracted stomach" can be pulled forward in front of the abdominal wound by a steady pull continued for a short while. I can corroborate this by my own experience. The future must decide as to this point. 4. The small size of the stomach in young children.

In cases of this kind, then, we would resort to Von Hacker's method. If the points in question cannot be decided before, but are found during the operation, we will close the oblique peritoneal wound and add at once Von Hacker's incision. In children the rectus muscle is rather poorly developed. Its sphincter-like contraction will rarely prevent leakage. Then we would be in need of the Von Hacker-Scheimpflug canula or Mikulicz's glass tampon (*loc. cit.*). Another drawback of Von Hacker's operation which has to be taken into account is that it will rarely close spontaneously after removal of the tube.

This spontaneous healing of the gastric fistula, as observed by Mikulicz, is certainly one of the most brilliant points in favor of Witzel's operation in this class of cases.

2. *Malignant stenosis.* Further experience is needed with reference to the merits and possible drawbacks in the final result of the Ssabanejew-Frank method before an attempt can be ventured at giving to each of the three operations its proper place. Yet the following may with propriety be said now. If further observation corroborates the experience made by Ssabanejew, Frank, and myself, namely, that after this method in every case perfect patency of the fistula also results, as after Witzel's,

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[1] Loc. cit.

I do not doubt that it will become the standard operation for gastrostomy in cases of malignant œsophageal stenosis, and for these reasons: The operation can be more rapidly done than Witzel's; it is also safer, because the stomach is not incised primarily, but after the peritoneal cavity is closed; the stomach is, as in Witzel's operation, opened at once in the same sitting; a wide fistula results, which easily admits the largest-sized tube or nozzle of a syringe; the tube can be left out with safety; contraction cannot occur; thus the patient will be very comfortable and can himself easily introduce the tube whenever a meal is due.[1]

If further experience should be adverse, however, which seems rather improbable, we again must elect between Von Hacker's and Witzel's operations only. About the same would hold good here that has been said above with reference to the cicatricial stenosis. If the patient be not too low, if the stomach wall can be drawn up and folded, Witzel's method will deserve preference in every case. But a large-sized tube should be selected for being infolded. Von Hacker's method will thus be reserved for those patients who are very low (cocaine anæsthesia).

It is to be hoped that, in view of these excellent operations, cases of malignant stenosis of the œsophagus will be nowadays referred to the surgeon in the early and not any longer in the last stage of the disease. "As soon as fluids and semi-solid food find some resistance in passing down, or as soon as the patient is visibly losing ground," says Mikulicz, "gastrostomy is indicated." I should make an addition to this dictum, and say, "and as soon as the scales show a steady, though perhaps slow decrease in the patient's weight." For this reason such patients should be ordered to weigh themselves every week or fourteen days and report to the physician. "It is absolutely wrong to let gastrostomy be the very last resort. By such temporizing, a condition of inanition will be produced in the patient which would contra-indicate an interference that otherwise has very little risk, if any. The surgeon cannot dare to do anything with the patient in a far-advanced state of inanition. The physician should be cognizant of the fact that a certain degree of strength and resistance is needed to stand even a relatively small operation; that a certain degree of active work of the tissues of the organs and of the whole organism is required to heal even a small wound; and that, lastly, the faculty of digestion and assimilation in the gastro-intestinal tract ceases in a certain stage of inanition, and cannot be awakened, even when a gastric fistula has been established. The patients starve to death with a full stomach, with full intestines." (Von Noorden.)

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[1] It may occur that the stomach wall will not yield enough to be drawn out in a cone: perhaps then, if the carcinoma involves the lower portion of the œsophagus and the cardia or a part of the gastric wall—if this be the case, Witzel's operation should be resorted to.

An early operation, on the other hand, will be less dangerous; it can be done under general anæsthesia; it will by its result, "the rapid improvement of the patient's general condition," enable the doctor to more easily conceal from the patient the real nature of his trouble;[1] it will spare the patient the continuously increasing difficulty in swallowing; it will prevent dangerous and useless attempts at dilatation; and it will prolong life on account of the slower growth of the tumor due to the elimination of the mechanical and chemical irritation produced by the passage of food. This point deserves to be especially emphasized; with reference to it, gastrostomy for carcinoma œsophagi must be put in parallel with colostomy for carcinoma recti. The latter gives less trouble, grows slower, and breaks down less rapidly, if excluded from the intestinal tract; the same holds good for carcinoma œsophagi.

Summing up, I would say:

1. There are now three useful and reliable methods of gastrostomy at the surgeon's disposal. Of these, one (Witzel's) prevents leakage with absolute certainty. The two others, if properly carried out, promise the same good result. Thus the patient who had been submitted to this operation will not starve from regurgitation of the food alongside the tube.
2. In view of this fact, gastrostomy should be resorted to "early" in cases that will sooner or later need this operation.
3. In cases of burn of the œsophagus, primary gastrostomy and timely dilatation of the contracting scar will most probably prevent conditions which at present generally confront the surgeon in this class of cases, and are sometimes incurable. Witzel's method of gastrostomy deserves preference. The oblique canal produced by it will close spontaneously when the tube has been removed. Thus a secondary operation will not be needed.
4. In cases of cancer of the œsophagus a gastric fistula should be established as soon as the scales show a steady decrease of the patient's weight.
5. Further experience is needed with reference to Ssabanejew-Frank's method before an attempt can be made at giving each of the three operations its proper place in the treatment of cancerous stenosis. If future observations be favorable, Ssabanejew-Frank's operation seems to be destined to become the standard one for malignant stricture of the œsophagus. If unfavorable, Witzel's method should be done wherever it can be carried out.
6. Von Hacker's method should then be reserved for far-gone cases, and should, if the patient be very weak, be done under cocaine-anæsthesia, best at two sittings. If properly performed the outlook for making the fistula close tightly around the tube is good.

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[1] And this so much oftener, as it has been frequently observed, also—as in almost every one of my cases—that patients with cancerous tight stricture of the œsophagus can swallow again, for a time at least, shortly after they have been fed through the gastric fistula only.